

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Process for the production of Coated Substrates

We, DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT vormals Roessler, of 9, Weissfrauenstrasse, Frankfurt (Main), Germany, a body corporate organised under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a process for the production of knitted and woven fabrics, fleeces, foils and like textile or non-textile flat and web-like supports provided with anti-static to electrically conductive synthetic plastic coatings or layers.

A considerable number of processes are already known for the production of coatings and coverings on many different types of supports, an example of such a process is lacquering in which resins and/or high-polymer substances are applied from solutions to a support and then dried to form a film. However, it is only possible in this way to form relatively thin layers. Aqueous dispersions of lacquers and/or synthetic plastics are also frequently used for similar coatings. This procedure is of very little use for the production of relatively thick coatings and is mainly used for impregnating textiles, for paints or for coatings on cardboard, paper and similar materials. Usually the use of such dispersions necessitates relatively long drying periods, sometimes even at stoving temperatures, so that a coherent film is formed. For the production of heavy coatings, as for example in the production of artificial leather, this process is not technically advantageous; on the contrary, synthetic plastic plastisols or synthetic plastic organosols are much more suitable for this purpose. By "plastisols," there is understood in this connection a mixture of a finely divided synthetic plastic in powder form (e.g. polyvinyl-chloride and/or vinyl-chloride copolymers) with suitable plasticisers, whereas "organosols" contain more or less large quantities

of volatile organic solvents as well as these constituents. These compositions are applied by brushing, casting, dipping or other known methods of application to the supports to be coated and the coated supports are thereafter finally heated at relatively high temperatures. In this way, the solvent which may be present is driven off and the mixture of synthetic plastic and plasticiser gells. A dense coating is obtained which is more or less solid and/or flexible and adheres to the support, which layer can be increased in thickness by repeated application and can, if desired, be provided with a final coating of a different composition.

In addition to the constituents already mentioned, the coating compositions generally contain fillers, colouring agents, stabilisers and other known additives. Carbon black has been frequently recommended as a colouring agent for black layers. Quantities of 0.1 to 2%, depending on the nature of the carbon black, produce a very dark colour. In addition to the colouring effect the use of carbon black provides a degree protection against ageing of the synthetic plastic layer, for example due to weather influences. The quantities of carbon black necessary for the colouring can be incorporated without particular difficulties into such coating pastes.

It is known in the rubber industry, in which substantially larger quantities of carbon black are used for the production of particular effects concerning the mechanical properties of the mixtures that it is possible, using special carbon blacks and, in some cases with observation of special precautions during manufacture, to obtain antistatic or electrically conductive mixtures. Such mixtures are particularly desirable and of importance in those cases where electrostatic charging must be avoided, where any static charging which may be present is to be dissipated or where for any other reasons conductive but also to a certain degree elastic

constructional components are required.

Since products produced from such rubber mixtures are not satisfactory for many purposes the need has long existed for the production of antistatic or electrically conductive coatings on all kinds of different supports. However, all the synthetic plastics and plastic mixtures previously referred to and normally used for coating purposes have a quite high specific resistance and a tendency to electrostatic charging. This is for example shown with many plastics by the usually undesirable property of attracting and retaining particles of dust.

With these materials, the transmission and surface resistances are in the orders of magnitude of above  $10^{11}$  ohm per cm, as also in the following, in accordance with the "principles for the electrical testing of insulating materials" in accordance with VDE Specification 0303, Part 3. Consequently, quantities of electricity applied by friction or static charging cannot flow away and very high, locally limited peak voltages become possible. In extreme cases, it can result in spark formation and consequently such synthetic plastics must not be used in zones where there is a danger of explosion, such as in underground mining.

Whereas the incorporation of relatively large quantities of carbon black into rubber mixtures does not present any difficulties, because the introduction can be effected on the roller, it has hitherto not been possible for the quantities of carbon black necessary to produce anti-static or conductive layers to be incorporated into brushable coating pastes. The reason for this is that the following three conditions must be simultaneously satisfied for economic use:

1) The coating composition must be of suitable viscosity and suitable rheological behaviour, brushable, i.e. flexible and not liable to break, and also sufficiently stable and storable.

2) The coating produced must have the necessary mechanical strength, it must adhere satisfactorily to the fabric or the support but must not be tacky on the surface.

3) The coating produced must have the required conductivity.

In conventional processes in which generally the carbon black was applied by way of the solid phase or as a paste, at most only two of these conditions could be satisfied. Sufficient carbon black for obtaining the required electrical properties could not be incorporated into brushable compositions which supply coatings of adequate mechanical strength; on the contrary, in order to produce the brushability, such a large quantity of plasticiser would have to be added to compositions with a corresponding carbon black content that the mechanical properties of the mixtures, after the heat treatment would be completely in-

adequate and the coatings would be tacky on the surface; recipes with a high carbon black content, from which could be produced coatings suitable as regards mechanical properties, do not provide pastes which can be brushed on.

Attempts have been made to overcome these difficulties by using organosols. However, such compositions show inadequate rheological behaviour, are not stable in storage and become demixed or separated into components after a short time. Furthermore, it is only with very great difficulty that they can be processed to give thin layers, so that it is only possible by this process, as is known, to produce a kind of lacquer coating with coating quantities up to 30 g. per square metre.

As already described, only the pasting method is suitable for the production of relatively thick coatings and it has also already been mentioned that attempts have been made to incorporate suitable quantities of carbon black into such pastes by introduction of the carbon black in admixture with plasticisers. However, this has only been successful to a limited extent and only with organosols with the disadvantages described above.

It has now surprisingly been found that the difficulties set forth here are overcome and layers obtained which are anti-static or conductive, depending on the carbon black concentration, by applying to the substrate a dispersion containing plastics into which has been incorporated electrically conductive carbon black which has been converted with the aid of a wetting agent into a dispersion, and the coating is dried and set in known manner.

In particular sheet like structures such as woven and knitted fabrics, fleeces and foils can be provided with anti-static to electrically conducting synthetic plastic coating by the pasting method using mixtures of

a) polyvinylhalides and/or copolymers containing predominant proportions of vinyl halide,

b) plasticisers

c) fillers, stabilisers and other usual additives and if desired:

d) volatile organic solvents and diluents, wherein a proportion of an electrically conductive carbon black in the form of an aqueous dispersion containing a wetting agent, which proportion is such that at least 5% by weight of carbon black is present, based on the weight of the vinyl compound, is incorporated into the plastisols or organosols, which are known *per se*, this mixture is then applied to one or both sides of the support, perhaps in several working steps, and dried and gelled by the action of heat.

The polyvinyl halides which can be used with great advantage according to the invention include primarily polyvinyl chloride pro-

duced by emulsion or suspension polymerisation and also polyvinyl fluoride and polyvinyl bromide. Copolymers of monomers forming these polymers with other copolymerisable chemical substances can also be used successfully when carrying out the process according to the invention. The substances available for the copolymerisation are in this case not used in preponderant quantities and only in quantities such that they have no disturbing effect on the process according to the invention. These substances include particularly vinyl esters, such as vinyl acetate, vinyl propionate, vinyl bromopropionate, vinyl chloracetate, vinyl alcohol, vinyl ether, vinyl chloroacetal, vinyl thioether and vinyl acetylene, as well as other monomers available for copolymerisation with vinyl halides, such as acrylic and methacrylic acids and their esters, vinylidene chloride and vinylidene fluoride, styrenes, acrylonitrile, butadiene, isoprene, chloroprene, isobutylene, ethylene, propylene, maleic and fumaric acid esters. It is obviously possible to add minor amounts of other known polymers and copolymers to the said vinyl halide polymers, provided that the presence thereof, as can easily be established, does not influence or does not substantially reduce the desired effect to be produced according to the invention.

For the production of the organosols, the usual organic solvents are added according to the invention, more especially those which are able to dissolve the polymers being used, such as tetrahydrofuran, cyclohexanone, methyl ethyl ketone and acetone.

As a suitable plastisol it is possible to use a conventional mixture of for example 50 to 70 parts by weight of polyvinyl halide to 50 to 30 parts by weight of plasticiser with suitable additions of fillers and/or stabilisers and/or advantageously adhesion promoters. Polyvinyl chloride of various types obtained by emulsion polymerisation and having a K value between 65 and 80 is advantageously used in these mixtures. In addition, however, it is also possible to consider mixtures of polyvinyl chloride suspensions and also additions of relatively small quantities of vinyl chloride-vinyl acetate copolymers, the K values of which can be between 45 and 65. Plasticisers which can be used according to the invention comprise particularly esters of aliphatic alcohols containing from 4 to 8 carbon atoms advantageously, and phthalic acid, sebacic acid, azelaic acid and adipic acid, and also possibly polymers, such as polypropylene glycol adipate and/or so-called secondary plasticisers or extenders, such as hydrocarbon compounds, chlorinated hydrocarbons and derivatives of higher fatty alcohols.

As fillers, there are to be considered known fillers, such as chalk, kaolin, talcum, alkaline earth carbonates or oxides, antimony tri-oxides, finely divided silicon or aluminium

oxides which are precipitated or obtained in the gas phase. As stabilisers, there are preferably used organic tin compounds or barium-cadmium compounds and, as adhesion promoters, isocyanates and/or polyurethanes, and epoxy compounds.

It has further been found to be advantageous that the carbon black dispersion to be added to the plastisol or the organosol should consist of 10 to 30% by weight and preferably 18 to 25% by weight of a carbon black having good electrical conductivity, about 2% by weight of a wetting agent and the remainder of water. Such dispersions are low viscosity fluids and are stable for a long time because of the very fine dispersion of the carbon black. Sulphonic acid-formaldehyde condensation products are advantageously used as wetting agents; however, it is also possible to use other anion-active substances, and also with advantage non-ionic products, such as addition products of ethylene oxide and compounds with reactive hydrogen. The production of such a dispersion is best effected by first of all making the carbon black into a thick paste in the solution of wetting agents and water and then producing a liquid carbon black dispersion with the aid of a high-speed mixer mechanism, for example of the type of the whirling chamber stirrer (so-called

"Ultra-Turrax" the words "Ultra-Turrax" are a Registered Trade Mark).

The suitable anion-active wetting agents include *inter alia* condensation products of naphthalene- $\beta$ -sulphonic acid and formaldehyde, while the suitable non-ionic wetting agents include oxethylation products of alkyl phenols. These groups of wetting agents are described in "Ullmanns Encyklopädie der techn. Chemie," 7th Volume (1956), P. 70.

The quantities necessary for these dispersions depend on the required properties of the product but mainly also on the necessary carbon black content of the mixture. It has moreover been found that the quantity of the aqueous carbon black dispersion to be incorporated into the paste and the content of carbon black with good electrical conductivity in such dispersion should be so chosen according to the invention that the proportion of the carbon black in the synthetic plastic coating is at least 5%, based on the plastic content in the coating composition, but is advantageously even higher in order to guarantee the required properties of the final product; in order to obtain products which conduct electricity, it is advantageous to incorporate into the coating composition a proportion of carbon black which is higher than about 10%, once again based on the proportion of plastic. However, antistatic products are obtained with a content of about 5% of a so-called highly conductive carbon black. It will be readily understood that it is not possible to draw any sharp separation line between antistatic pro-

2 properties and electrical conductivity of the syn-  
thetic plastic coatings. By suitable choice of  
the types of carbon black and with increasing  
5 quantity of the proportion of carbon black in  
the synthetic plastic mixture, it is possible  
to produce a continuous rise in the electrical  
conductivity of the plastic coatings. It is  
surprising that the use of the aqueous carbon  
10 black dispersion permits the proportion of  
carbon black to be increased to such an extent  
that surface resistances of about  $10^8$  ohms  
can be achieved, which can be considered as  
a very good result and completely adequate  
for the proposed purposes of use.

15 According to the invention, types of carbon  
black which are already known as being highly  
conductive are used. These are found among  
the acetylene, furnace and channel carbon  
blacks; they are particularly distinguished by  
20 the common property that their specific sur-  
face area is greater than  $100 \text{ m}^2/\text{g}$ . Such  
carbon blacks have very good electrical con-  
ductivity and also impart this property to the  
products containing them, such as products  
25 consisting of rubber. Types of carbon black  
with a lower specific surface, such as those  
which can be obtained by the processes re-  
ferred to, are likewise very good for conducting  
electric current. However, because of the dif-  
30 ferent surface properties, they cannot be in-  
corporated with equally good results into the  
starting mixtures which can be used according  
to the invention, because the conductivity  
of the articles produced from these mixtures  
35 when using such carbon blacks falls consid-  
erably as compared with those having types of  
carbon black recommended according to the  
invention and a substantially larger proportion  
of carbon black would have to be used in  
40 order to produce the required properties of  
the end products.

A carbon black which has proved particu-  
larly desirable in tests is one with a specific  
electrical resistance of  $0.06 \text{ ohm} \times \text{cm}$  (mea-  
45 sured at 300 atm.) with a mean particle size  
(arithmetic mean) of  $277 \text{ \AA}$  and a surface  
according to BET of  $133 \text{ m}^2/\text{g}$  (Russ. Corax  
L of Degussa). However, corresponding active  
types of carbon black with even greater speci-  
50 fic surfaces, such as 694 or  $1030 \text{ m}^2/\text{g}$  (Russ.  
activates A 26 and A 31 of Degussa) and  
other comparable carbon blacks, can also be  
satisfactorily used.

A particularly expedient method of incor-  
55 poration of the carbon black is for the carbon  
black dispersion to be slowly and gradually  
with low shearing stress for example with a  
normal propeller-type stirrer in quantities of  
up to 1:1 into the plastisol or the organosol  
60 to which may have been added additives which  
limit the pot life, such as special  
adhesion promoters and/or wetting agents.  
polydiisocyanates, dimethacrylates, di-  
acrylates, polyesters are examples of  
65 such additives. It is of great importance

that the shearing forces which become effective  
when the carbon black is being incorporated  
are not too high, such as sometimes occur  
in turbo mixers and fluid mixers. It has in  
fact been found that the conductivity of the  
70 coatings obtained falls again if the compo-  
sitions are worked too intensively.

If these manufacturing procedures are com-  
plied with, coatings compositions of excellent  
consistency, great stability and good work-  
75 ability are obtained. They are completely  
homogeneous, pliable and have the necessary  
viscosity; they have the necessary stability  
in storage and also do not separate before  
the doctor blade. This behaviour does not in  
any way conform to expectations, especially  
as the great difficulties already referred to  
have been found with the incorporation of  
carbon black into brushing compositions. It  
must therefore be considered as very surprising  
85 that the process according to the invention  
leads to products having the required elec-  
trical properties.

The pastes can be further processed by all  
conventional coating methods, for example  
90 by dipping, casting or by the various brush-  
ing methods. The coatings obtained after the  
final heating show very good mechanical  
strength values. The specific resistance of the  
coatings can be varied in any desired manner  
95 within the technically interesting limits of  
 $10^3$ — $10^8$  ohms per cm. by the alteration of  
the quantities and type of carbon black with-  
out observing any important disadvantageous  
alteration in the mechanical properties of the  
100 coatings or in the workability of the pastes.

As support for the coatings, it is possible  
with particular advantage to use woven or  
knitted fabrics or fleeces, the thread position  
of which can be more or less closed or open,  
105 and which consists of natural or synthetic  
fibres or yarns; artificial fibres of polyesters  
being particularly preferred with more open  
fabrics because of its mechanical strength.  
However, non-porous foils of synthetic plas-  
110 tics; papers; cardboards or felts are also  
suitable, as well as sheets of different metals.  
Suitable stabilisers and adhesion promoters  
may be added where appropriate.

The invention is further illustrated by the  
115 following Examples.

#### EXAMPLE 1.

20 parts by weight of an electrically highly  
conductive carbon black are formed into a  
paste with 2 parts by weight of a sulphonic  
120 acidformaldehyde condensation product as  
wetting agent and 78 parts by weight of tap  
water and worked by means of a high-speed  
stirrer into a carbon black dispersion.

The carbon black dispersion is added to a  
125 plastic dispersion which contains about 40%  
by weight of a vinyl chloride copolymer and  
also a plasticiser. By simple stirring, the  
carbon black is distributed in a completely  
uniform manner in the plastic dispersion. As  
130

will be seen from the following Table: the viscosity of the plastic dispersion remains unchanged even after the carbon black has been incorporated by stirring.

Carbon black addition in % by weight, calculated on plastic solid substance	Viscosity in Ford seconds 4 mm. nozzle			
	immed- iately	after 1 hour	after 5 hours	after 24 hours
10	12	12	12	12
20	12	12	12	12
30	12	12	12	12

(The establishment of the viscosity in Ford seconds is known. The liquid to be measured is introduced into a standard beaker and is allowed to run out through a nozzle spring tongue electrode with a length of 100 mm. and a spacing of 10 mm. disposed in the bottom thereof. The running out time in each case gives the viscosity in Ford seconds). The measuring voltage was 4.5 volts up to a resistance of  $10^6 \Omega$ , and above this 10 volts direct current. In other respects, the procedure according to VDE 0303.8 7 was used and the following measurement results were obtained:

Carbon black addition in % by weight, calculated on plastic solid substance	Viscosity in Ford seconds 4 mm. nozzle			
	immed- iately	after 1 hour	after 5 hours	after 24 hours
0	12	12	12	13
10	12	12	12	13
20	12	12	12	15
30	12	12	13	18

**EXAMPLE 2.** 20 parts by weight of an electrically highly conductive carbon black are formed into a paste as in Example 1 with 2 parts by weight of a sulphonic acid-formaldehyde condensation product as melting agent and 78 parts by weight of tap water and mixed with a high-speed stirrer to form a carbon black dispersion. The carbon black dispersion is added to a plastic dispersion which contains a copolymer based on acrylic acid ester and which has a plastic content of 40 parts by weight. In a manner analogous to Example 1, the viscosity was measured as a function of time. As is shown from the values indicated, the workability was not made difficult in any way due to the particular method of introducing carbon black into the plastic dispersion.

The carbon black dispersion is added to a plastic dispersion which contains a copolymer based on acrylic acid ester and which has a plastic content of 40 parts by weight. In a manner analogous to Example 1, the viscosity was measured as a function of time. As is shown from the values indicated, the workability was not made difficult in any way due to the particular method of introducing carbon black into the plastic dispersion.

Carbon black addition in % by weight, calculated on plastic solid substance	Surface resistance in $\Omega$	
	after treatment at 110° C.	after treatment at 170° C.
0	$1.5 \times 10^9$	$1.0 \times 10^9$
1	$6.7 \times 10^8$	$4.1 \times 10^8$
2	$6.4 \times 10^8$	$3.5 \times 10^8$
3	$4.0 \times 10^8$	$3.0 \times 10^8$
4	$3.1 \times 10^8$	$1.0 \times 10^8$
5	$6.6 \times 10^7$	$2.7 \times 10^7$
6	$3.5 \times 10^7$	$2.0 \times 10^7$
7	$2.7 \times 10^7$	$1.3 \times 10^6$
8	$8.7 \times 10^4$	$1.8 \times 10^5$
9	$4.4 \times 10^4$	$8.9 \times 10^4$
10	$3.7 \times 10^4$	$2.2 \times 10^4$
15	$8.1 \times 10^3$	$1.5 \times 10^4$
20	$2.9 \times 10^3$	$1.6 \times 10^3$
25	$2.5 \times 10^2$	$1.1 \times 10^2$
30	$4.0 \times 10^1$	$1.7 \times 10^1$

The carbon black-plastic dispersions were applied to paper board, as in Example 1. The drying was carried out, in one case at room temperature and in another, at 180° C. (period 15 minutes). After the application of

conductive silver electrodes, the specific surface resistance was established as in Example 1 and the following measurement results were obtained:

10

Carbon black addition in % by weight, calculated on plastic solid substance	Surface resistance in $\Omega$	
	after drying at room temperature	after treatment at 110° C.
0	$2.9 \times 10^8$	$3.0 \times 10^8$
2	$1.4 \times 10^8$	$1.2 \times 10^8$
4	$3.4 \times 10^8$	$3.0 \times 10^6$
6	$2.0 \times 10^6$	$1.5 \times 10^6$
8	$2.5 \times 10^5$	$2.9 \times 10^5$
10	$1.0 \times 10^4$	$2.8 \times 10^4$
20	$5.0 \times 10^3$	$1.0 \times 10^3$
30	$1.7 \times 10^2$	$1.5 \times 10^2$

## EXAMPLE 3.

20 parts by weight of a carbon black dispersion were added to 100 parts by weight of a basic composition, consisting of:

- 5 42.5% by weight of an emulsion polyvinyl chloride with the K value 75 which can be made into a paste,
- 33.5% by weight of dioctyl phthalate,
- 10 12.0% by weight of dioctyl adipate,
- 6.0% by weight of antimony trioxide,
- 1.0% by weight of barium-cadmium laurate,
- 5.0% by weight of polydiisocyanate (reaction product of toluylene-2,4-diisocyanate and a trihydric, aliphatic alcohol).

The carbon black dispersion consists of 22.5 parts by weight of a highly active furnace black (ash content 0.07%, BET surface 133, mean particle size 277 Å, vibrated weight 240 g/l, vibrated volume 420 cc/100 g, specific electrical resistance at 300 atm.: 0.06 ohm per cm), 4 parts by weight of a non-ionic wetting agent, such as the oxethylation products of aromatic oxy compounds, for example a condensation product of ethylene oxide and nonyl phenol, and 73.5 parts by weight of water. The admixing of the carbon black dispersion is effected slowly and in portions with the aid of a low-speed blade-type stirrer.

Using a rubberised cloth coating machine, a nylon fabric with the thread position 9/9 consisting of 840 denier fibres is coated with the coating composition produced in this way, the composition being applied as three coatings on each side, the layers having a total weight of about 270 g/m<sup>2</sup> on each side. After the coating operation, the web of material is conducted through a pre-heating channel, in which the heating is so adjusted that the web of material is not exposed to a temperature higher than about 100° C. until the water content of the coating is completely evaporated. In a later section of the heating channel, the temperature is then raised to about 170° C., so that the coating gels out.

By means of this process, there is formed a flexible, abrasion-resistant coated material which has a surface resistance of  $2 \times 10^6$  to  $2 \times 10^7$  ohms. This surface resistance was measured with the Siemens rod electrode in accordance with the VDE Specification 0303 referred to above. Coatings with the same basic composition but without addition of the carbon black dispersion have a surface resistance higher than  $10^{10}$  ohms.

## EXAMPLE 4.

50 parts by weight of the carbon black dispersion described in Example 1 are slowly added by means of a low-speed blade-type stirrer to 100 parts by weight of the basic composition also described according to Example 1. Using the coating composition as produced, which has

good spreading properties, a cotton fabric (thread position 23/22 consisting of yarns of the No. 34/34) and coated with a normal polyvinyl chloride priming coat (about 90 g/m<sup>2</sup>) is provided with additional coatings on one side on a rubberised cloth coating machine. In two operations, about 100 g/m<sup>2</sup> are applied and the material is further treated as described in Example 1.

The finished material has a surface resistance of about  $1 \times 10^4$  ohms, measured with the Siemens rod electrode in accordance with the aforementioned VDE Specification 0303. The material is very flexible, dry to the touch and resistant to abrasion.

The efficacy of the process employed is clearly apparent from the foregoing Examples. The surface resistance can be lowered from the order of magnitude  $10^3$  to  $10^1 \Omega$  by using the process according to the invention. This means that for the reliable production of an antistatic surface coating, a content of 8 to 10% by weight of carbon black must be produced in the plastic layer, while 25 to 30% by weight of carbon black must be incorporated into the plastic layers in order to have "good-conductivity" plastic coatings.

It is not possible for such quantities of carbon black to be arranged in the plastic dispersions by direct addition, since in this case, as already described above, the plastic dispersions flocculate out and the films obtained are not flat, but are permeated with thick nodules of carbon black. When the process according to the invention is used, on the contrary, completely smooth and lustrous films are produced at the low carbon black concentrations and completely smooth films with a slightly matt appearance with the high carbon black concentrations. The bonding strength is still satisfactory, even with relatively high carbon black concentrations. Thickening agents for the production of brushing pastes can be added in the usual way. One particular advantage is also to be seen in the easy workability which is produced when using the process according to the invention.

## WHAT WE CLAIM IS:—

1. A process for the production of synthetic plastic layers or coatings on substrates by applying a dispersion which contains plastics, wherein electrically conductive carbon black is converted with the aid of a wetting agent into a dispersion, the carbon black dispersion is combined with an aqueous dispersion of a synthetic plastics material known *per se*, the carbon black-plastics dispersion is applied to the support and then is dried and fixed in known manner, the carbon being present in an amount of at least 5% by weight, based on the weight of the plastics material.
2. A process as claimed in claim 1 wherein the coating is produced by the pasting method using a mixture of:
  - a) polyvinyl halides and/or copolymers

with predominant proportions of vinyl halide;  
b) plasticisers,  
c) fillers, stabilisers and other known additives and, if desired,

10 d) volatile organic solvents or diluents, wherein an electrically conductive carbon black in the form of an aqueous dispersion containing a wetting agent is introduced into the plastisols or organosols known *per se* in a proportion such that at least 5% by weight of the carbon black is present based on the weight of the vinyl compound, this mixture is then applied on one or both sides to the support possibly in several working steps, and is dried and gelled by the action of heat.

15 3. A process as claimed in claims 1 or 2 wherein the substrate is a woven or knitted fabric, a fleece or a foil.

20 4. A process as claimed in claim 1 wherein the proportion carbon black in the coating is from 5 to 30%.

5. Process as claimed in any of claims 1 to 4 wherein the aqueous carbon black dispersion consists of 10 to 30% by weight

25 and advantageously 18 to 25% by weight of an electrically conductive carbon black, about 2% by weight of a wetting agent and the remainder consists of water.

30 6. Process as claimed in any of claims 1 to 4, wherein the carbon black dispersion consists of 10 to 30% by weight of an electrically highly conductive carbon black, 2% by weight of an anion-active wetting agent, the remainder being water.

35 7. A process as claimed in any of claims 1 to 6, wherein the carbon black dispersion is incorporated into the plastisol or organosol slowly and with low shearing stress in quantities up to 1:1.

40 8. Coated substrates produced by the process claimed in claim 1 substantially as described with reference to any of the Examples.

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